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Project Summary for a Construction Permit Application from Geneva Energy, LLC for a Tire Fuel Fired Power Plant 1705 Cottage Grove Avenue Ford Heights

Site Identification No.: 031801AAE
Application No.: 05040020

Illinois EPA Contacts:

Permit Analyst: Eric Jones
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Important Dates

Application Received: April 7, 2005
Comment Period Begins: July 24, 2005
Public Hearing: September 7, 2005
Comment Period Closes: October 7, 2005

I. INTRODUCTION

Geneva Energy, LLC (Geneva Energy) has submitted an application for a construction permit to restart the existing tire fuel-fired power plant in Ford Heights. As part of restart of the plant, Geneva Energy has also proposed various changes to the plant, including installation of facilities for storage and handling whole tire fuel and operation of the boiler with both shredded tire fuel and whole tire fuel. (Refer to Table A for a complete listing of these changes.) The proposed changes do not involve increases in the permitted annual emissions of the boiler.

A construction permit is required for this project due to the proposed changes to the plant and to address the restart of the boiler after an extended interruption in operation.

II. BACKGROUND INFORMATION ON THE PLANT

This plant is a steam electric power plant, in which steam produced by a boiler is used to power a steam turbine-generator. The primary fuel for the plant is waste tires. Natural gas is used as an auxiliary fuel for startup of the plant and to assist in operation of the boiler. The plant has an approximate electrical capacity of 22 megawatts (MW), gross output. In addition to the boiler, the plant also has other equipment and facilities associated with operation of the boiler, including handling, processing (shredding) and storage of the tire fuel. The handling and storage of the whole tires at the site is governed by state rules for the management of waste tires, 35 IAC Subtitle G: Waste Disposal, Subchapter m: Management of Used and Waste Tires. For shredded tire fuel, which is currently not addressed by these rules, similar management practices have been required as a condition of the air pollution control permits for the plant.

Geneva Energy purchased this plant in 2005. The plant was constructed and originally operated by Chewton Glen Energy, LLC (Chewton Glen LLC). It obtained the initial construction permit for the boiler (Permit No. 92090009) in November 1993. Shortly after construction was complete, Chewton Glen LLC went bankrupt and operation ceased. Chewton Glen retained possession until 1999, when the plant was sold to New Heights Recovery & Power, LLC (New Heights LLC). After purchasing the plant, New Heights LLC obtained a construction permit for to resumption of operation of the plant (Permit No. 99050003). During its ownership of the plant, New Heights LLC undertook a number of improvements to the plant’s equipment and operation, as summarized in Attachment 1. New Heights LLC operated the plant until January 2004, when the steam turbine suffered severe damage, so that electricity could not be generated.

In addition to construction of a power plant at the site, Chewton Glen LLC also constructed a plant to produce crumb rubber, i.e., fine rubber particles, by shredding waste tires. New Heights LLC added an additional plant to produce crumb rubber from waste tires by a very low temperature cryogenic process. These crumb rubber plants are no longer operating and have been disassembled.

Geneva Energy will not be resuming crumb rubber production at the site.

To resume operation of the power plant, Geneva Energy will rebuild the damaged steam turbine. It has also proposed to install a handling system for whole tire fuel and implement additional enhancements to the plant as listed in Table 1.

Table 1. Geneva Energy Proposed Activities

Activity	**Description**
Steam Turbine	Rebuild of turbine bearings, blades and other components.
Whole Tire Fuel Conveyor	Addition of a conveyor and handling system for whole tire fuel, providing a redundant fuel delivery system to the boiler.
Existing Tire Fuel Feed System	Alterations to conveyors, weigh systems, and lock hoppers.
Distributive Control System	Modernize and enhance plant controls.
Flue Gas Cooler	Installation of a new flue gas heat exchanger cooler.
Continuous Emissions System	Installation of new GM 31 analyzer.

As part of its application, Geneva Energy has also requested certain adjustments to the provisions for the Automatic Tire Feed Cutoff (ATFC) System required for the boiler by prior permits. It has also asked that its construction permit for resumption of operation also include provisions addressing all ancillary operations for the boilers, some of which were previously addressed by a separate construction permit from the boiler permits.

III. DESCRIPTION OF EQUIPMENT

Boiler

The boiler is a reciprocating grate boiler with a maximum rated heat input of 240 mmBtu/hr. In a grate boiler, solid fuel is burned on a metal floor or grate in the bottom of the furnace section of the boiler. The fuel is added at one side of the grate, through hoppers and associated feeders. The fuel burns as it moves across the grate. On the far side of the grate, the ash and other non-combustible material that remains falls off the grate into a hopper. The rate at which fuel is burned is controlled by the rate at which fuel is added to the bed, with the speed with which the reciprocating action of the various sections of the grate moves fuel across the bed and the flow rate of combustion air into the furnace managed to provide for complete combustion. This combustion air is split between under-fire air, which is blown upwards through openings in the grate, and over-fire air which is introduced through ports located on the side of the furnace above the grate.

The boiler was designed to burn tire fuel, either as whole waste tires or shredded waste tires. Tires are a high Btu fuel with

heating values ranging from 11,500 Btu/lb for steel belted tires to 16,900 Btu/lb for Kevlar belted tires. The form of the tire fuel, whole or shredded, does not affect the properties of the material as fuel. Historically, the boiler has operated on shredded tire fuel. Geneva Energy reports that this was a result of the production of crumb rubber at the site, which required use of an initial, primary shredder and the handling and storage of shredded tires prior to further processing into crumb rubber. As a result, the system to handle tire fuel for the boiler was designed and constructed for shredded tires. However, this did not affect the design and construction of the boiler/combustion system and associated equipment. Geneva Energy has indicated that its considers the ability to use whole tires desirable because it does not require shredding of waste tires, which is no longer required at the site because production of crumb rubber is not being pursued. Handling of whole tires is also easier in certain respects that handling of shredded tires, since whole tires do not pack together. However, it is retaining the ability to handle shredded tires as that maintains the ability to accept shredded tires for use as fuel in the boiler.

To get whole tires into the boiler, Geneva Energy proposes to install a new whole tire conveyor system that will have its last section located below the last section of the shredded tire conveyor system at to the boiler. The new whole tire system will feed into the four existing fuel feed chutes and lock hoppers on the boilers that introduce fuel into the furnace of the boiler. As the burning of whole tires takes longer than burning the same mass of shredded tires, the boiler grate's reciprocating speed will be adjusted to maintain adequate time for burn out across the grate. The reduction in speed will allow an increase in the fuel bed thickness maintain a uniform release of heat from the boiler.

The boiler has also two natural gas-fired burners that are used to warm the boiler to the operating temperature before feeding tire fuel. Natural gas will also be used if necessary to maintain the required operating temperature while burning tires and while tire fuel is present on the grate during a controlled shut down.

Potential emissions from burning any material are particulate matter (dust, soot, fly ash), sulfur dioxide (SO_2), nitrogen oxides (NOx), organic materials, and carbon monoxide (CO). The amount of emissions is determined by the nature and composition of the fuel material, the nature and effectiveness of the combustion control and practices required for the boiler itself, and the effectiveness of add-on air pollution control equipment.

In addition to standard combustion controls for management of air flow and temperatures in the boiler, the boiler is equipped with an operating system that can automatically stop the feeding of fuel during malfunction or upset conditions in the boiler or its control equipment. The occurrence of such conditions is determined by monitors on key boiler operating parameters and by continuous emission monitors for the principal pollutants. Geneva Energy has requested revisions to the levels of certain operating parameters that would trigger such cutoff. These

revisions should allow for more stable operation of the boiler, without stopping fuel flow for conditions from the operators of the boiler could readily recover. The overall effect of these revisions should be to reduce emissions of the boiler, as it avoids the number of startups of the boiler.

The emissions from this boiler are controlled are three add-on control devices are used to reduce emissions from this boiler. First, the NOx emissions are controlled by an SNCR system that injects urea into the hot flue gases at an appropriate point in the ductwork to reduce NOx by selective non-catalytic reduction (SNCR). At the elevated temperatures in the boiler, the urea (H_4N_2CO) reacts with the NOx to restore it to nitrogen (N_2), forming water (H_2O) as a by-product. Second, a baghouse or fabric filter removes dust or particulate matter from the flue gases. The layer of particulate matter material that builds up on the fabric filter surface is periodically cleaned by air flow in the reverse direction. The particulate matter cake then falls into hoppers. The collected fly ash must be transported off-site for disposal in accordance with all local, state and federal regulatory requirements. Third, a lime scrubber system removes emissions of the acid gases SO_2 and hydrogen chloride (HCl) from the flue gas. This is done by "spraying" a water solution of calcium hydroxide (CaOH). The calcium hydroxide reacts to "absorb" the acid gases in the combustion gas stream, retaining and removing them in the liquid slurry. The spent calcium hydroxide, which consists of calcium sulfate (gypsum) and sodium chloride (salt) will be transported offsite for disposal.

Ancillary Operations

The plant has ancillary operations that support the tire fuel fired power plant. Tires are typically delivered to the site whole. Whole tires designated for shredding will be processed through the existing tire shredder. Particulate emissions from the shredder and conveyors are minimized by enclosure and water sprays. Because crumb rubber is no longer being produced at the site, the volume of tires shredded at the plant will be reduced.

In addition to handling fuel, the plant also handles chemicals for the treatment of the water circulated in the boiler and used in the air pollution control equipment. The bulk dry material handled for operation of the plant include pebble lime, soda ash, and hydrated lime. The particulate emissions from the handling systems for these materials are controlled by enclosure or baghouses, as appropriate for the form of the material. Liquid chemicals, including sulfuric acid, caustic soda, sodium hypochlorite, s are also needed for the operation of the boiler. Minimal emissions of particulate matter and volatile organic material occur from these storage tanks and associated reaction tanks.

Finally Geneva Energy has addressed two small reciprocating engines installed at the plant to power electrical generators that supply backup power to the plant.

IV. APPLICABLE REGULATORY EMISSION STANDARDS

All emission sources in Illinois must comply with the Illinois Pollution Control Board's emission standards. The Board's emission standards represent the basic requirements for sources in Illinois. The Board has standards for nitrogen oxides (NOx), carbon monoxide (CO), volatile organic material (VOM), sulfur dioxide (SO_2), and particulate matter (PM). The Illinois EPA has determined that the emission units, control equipment, and operational practices at the existing plant should readily comply with all applicable Board emission standards.

The boiler is capable of burning natural gas at greater than 100 million Btu/hr so the boiler is also subject to the federal New Source Performance Standards (NSPS) for Commercial-Institutional Steam Generating Units, 40 CFR 60 Subparts A and Db. Compliance with applicable emission standards will be verified by emissions monitoring.

The tire fuel fired boiler is an affected source for purposes of the Acid Rain Program, pursuant to Title IV of the Clean Air Act. A copy of the current Acid Rain permit is attached to this Draft Permit.

The plant is subject to the Clean Air Permit Program (CAAPP). New Heights LLC had submitted a CAAPP permit application to the Illinois EPA pursuant to Title V of the Clean Air Act. A condition has been included in this permit requiring the submittal of an updated CAAPP application after resumption of operation of the plant. Until a CAAPP permit is issued the operation of the plant would be governed by the Construction Permit.

V. BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS

Section 55(h) of the Environmental Protection Act requires new boilers burning tires to comply with Best Available Control Technology (BACT) as BACT is further defined in Section 9.4 of the Act. BACT can include emission limits, operating standards and equipment standards to address emissions of particulate matter, SO_2, NOx, acid gases, heavy metals and organic materials. BACT was determined as part of the application review process under the original construction permit application for the boiler. The Illinois EPA's BACT determination was contained in the original Construction Permit issued to Chewton Glen for the boiler, and summary of the elements of the BACT determination is provided below. Geneva Energy's request to resume operation of the plant startup of the plant does not trigger the need to revisit this BACT determination. Although the boiler has not been operated for approximately one year due to steam turbine damage, a variety of measures have been undertaken to preserve and maintain the boiler and plant for use. The changes to use whole tires also do not affect fundamental aspects of the original design and construction of the boiler.

The first aspect of BACT established for this plant is effective combustion or "good combustion practices." The BACT determination sets pollutant emission limits for products of

incomplete combustion including CO and hydrocarbons and establishes operating parameter limits that will be used to maintain good combustion conditions.

As previously explained, the air pollution control system for the boiler consists of a SNCR system , a baghouse, and a lime scrubber.

SNCR control technology has been used successfully on tire-burning boilers, for which it is effective for control of NOx emissions. The BACT NOx emission rate limit established for this boiler is 0.0925 lb/mmBtu or not less than 40 percent reduction from the level of uncontrolled NOx emissions.

Fabric filters can provide very effective control of dust or particulate matter emissions. baghouse was determined to be BACT for this boiler. The BACT particulate matter emission limit from the boiler was set at 0.0275 lb/mmBtu, as measured or would be measured by USEPA Reference Method 5. An alternative standard is also established based on removal efficiency by the filter of at least 99.5 percent of the particulate emissions.

Scrubbing is commonly established as BACT for control of SO_2 emissions from burning fuels and materials containing significant amounts of sulfur. The use of a wet lime scrubber system was determined to be BACT for this boiler. The SO_2 BACT emission limit is set at 0.10 lb/mmBtu or 95.4 percent control efficiency, with compliance determined by monitoring. In addition to SO_2, hydrogen chloride (HCl) is emitted from the burning of tires due to the chlorine compounds contained in the rubber. The BACT limit for HCl was established at 0.0055 lbs/mmBtu or 91 percent removal.

VI. PLANT EMISSIONS

The permitted annual emissions from the plant are summarized in Attachment 1 of the draft permit. This attachment includes the historic limits on emissions of the boiler as well as new limits for lead and formaldehyde, which were not explicitly limited in previous permits. Other limits on emissions, including limits on the boiler’s emissions in pounds/hour are included within the specific sections of the permit. (Refer to Condition 2.1.6-1 for the detailed limits on the emissions of the boiler.)

VII DRAFT PERMIT

The Illinois EPA has prepared a draft of the construction permit that it would propose to issue to Geneva Energy for the restart of the plant. The permit restates and consolidate the emission control requirements applying to the various emission units at the plant. In addition to routine compliance procedures those emissions, the applicable regulatory requirements and compliance procedures (i.e., emissions testing, continuous monitoring, recordkeeping and reporting) associated with those requirements, the permit also addresses the additional procedures that are appropriate to address resumption of operation. For this

purpose, the permit subject the boiler to a complete suite of shakedown and performance testing requirements as if it were a new boiler.

As already discussed, the permit would also allow use of whole tires as well as shredded tires as fuel, with necessary changes to material handling systems to accomplish this. The permit would also revise certain trigger levels for the automatic waste feed cutoff system that should facilitate improved operation of the boiler.

VIII REQUEST FOR PUBLIC COMMENT

It is the Illinois EPA’s determination that the project meets all applicable state and federal air pollution control requirements, subject to the terms and conditions proposed in the draft permit. The Illinois EPA is therefore proposing to issue a construction permit for this project.

Comments are requested on this proposed action by the Illinois EPA and on the terms and conditions of the draft permit.

Attachment 1: Previous Plant Enhancements by New Heights LLC

Enhancement	Description
CEMS and DAHS (Data Acquisition and Handling System) Upgrades	• Installation of a new DAHS with increased capacity, capability and software support. • New pressure based stack flow meter with more durable anemometer probes. • Tubing upgrades and plumbing changes. • New H_20, O_2-dry and O_2-wet multi-analyzer.
Combustion Controls Distributive Control System(DCS)	Programming upgrades to DCS to balance steam and power production during high load periods and further computerize operations.
Grates and Tire Feeder System	Installation of tire feed lock hoppers and increased airflow grooves in grates to prevent plugging of boiler grates.
NOx Combustion Control	• Modified over fire air nozzles to reduce plugging. • Adjusted DCS to improve over fire and under fire air control.
Economizer Section of Boiler	Installation of new acoustic horns to improve fly ash removal from the economizer to supplement the existing steam-soot blowers.
Baghouse	Improved operation and maintenance plan.
Scrubber System	• Retention of outside consultant for evaluating & recommending improvements. • Implemented improvements to pH measurement system and plumbing and maintenance simplifications.
NOx Selective Non-Catalytic Converter Reduction (SNCR) System	• Evaluation by outside consultant to optimize SNCR for controlling NOx. • Temperature profiling and NOx removal testing. • Implemented logic changes to DCS. • Relocation of urea injectors.
Ash Building	Construction of a concrete and steel building for ash discharge area and fly ash discharge hopper.